



SHILAP Revista de Lepidopterología

ISSN: 0300-5267

avives@eresmas.net

Sociedad Hispano-Luso-Americana de
Lepidopterología
España

Popovi, M.; Duri, M.; Franeta, F.; van Deijk, J. R.; Vermeer, R.
First records of *Lycaena helle* ([Denis & Schiffermüller], 1775) for the Balkan Peninsula (Lepidoptera:
Lycaenidae)
SHILAP Revista de Lepidopterología, vol. 42, núm. 166, abril-junio, 2014, pp. 287-294
Sociedad Hispano-Luso-Americana de Lepidopterología
Madrid, España

Available in: <http://www.redalyc.org/articulo.oa?id=45532157009>

- How to cite
- Complete issue
- More information about this article
- Journal's homepage in redalyc.org

redalyc.org

Scientific Information System
Network of Scientific Journals from Latin America, the Caribbean, Spain and Portugal
Non-profit academic project, developed under the open access initiative

First records of *Lycaena helle* ([Denis & Schiffermüller], 1775) for the Balkan Peninsula (Lepidoptera: Lycaenidae)

M. Popović, M. Đurić, F. Franeta, J. R. van Deijk & R. Vermeer

Abstract

This paper presents the first finding of *Lycaena helle* ([Denis & Schiffermüller], 1775) in the Balkan Peninsula on Balkan (Stara Planina) Mts. The butterfly was discovered in the bordering region between Serbia and Bulgaria. European distribution of this boreo-montane species is confined to northern parts of the continent with isolated colonies in central and south-western Europe. It is shown to be endangered at both European and regional level, and thus marked as one of the priority species for protection. In the Balkans the species can be found in mountain bogs associated with small streams where plant communities *Geo coccinei-Deschampsietum caespitosae* are developed. Due to land abandonment these habitats are prone to succession toward a forest ecosystem and should be monitored and managed in order to sustain the current state. It could be achieved more easily in Bulgaria, where habitats are a part of the Natura 2000 network, but it is harder for Serbia where ski tourism has been actively developed in the last decade, and where the European Union legislation does not apply.

KEY WORDS: Lepidoptera, Lycaenidae, *Lycaena helle*, Stara Planina, habitat, conservation, Serbia, Bulgaria.

Primer registro de *Lycaena helle* ([Denis & Schiffermüller], 1775) para la Península Balcánica (Lepidoptera: Lycaenidae)

Resumen

Este trabajo presenta el primer registro de *Lycaena helle* ([Denis & Schiffermüller], 1775) en la península Balcánica sobre los montes balcánicos (Stara Planina). La especie fue descubierta en la frontera entre Serbia y Bulgaria. La distribución europea de esta especie boreo-montane está confinada a las partes del norte del continente con colonias aisladas en el centro y suroeste de Europa. Está demostrado que es una especie en peligro de extinción tanto a nivel europeo como regional y siendo, por tanto, una especie que necesita prioritaria protección. En los Balcanes la especie puede encontrarse en zonas montañosas relacionadas con pequeños torrentes donde se desarrolla una asociación de plantas *Geo coccinei-Deschampsietum caespitosae*. Debido al abandono de la región estos hábitats son propensos a evolucionar hacia un ecosistema de bosque y tendría que realizarse un seguimiento, para mantenerlos en su estado actual. Podría conseguirse en Bulgaria, donde los hábitats forman parte de la red Natura 2000, pero es más difícil en Serbia donde el turismo de esquí se ha desarrollado activamente en la última década y donde la legislación europea no se aplica.

PALABRAS CLAVE: Lepidoptera, Lycaenidae, *Lycaena helle*, Stara Planina, hábitat, conservación, Serbia, Bulgaria.

Introduction

The Violet Copper - *Lycaena helle* ([Denis & Schiffermüller], 1775) is a relict boreo-montane species with a Palearctic distribution. It is found from the French Pyrenees in the west throughout central and northern Europe, including most of Fennoscandia. In Asia, the butterfly inhabits Russia

(from Siberia to the Ussuri region) and reaches the Far East through Mongolia and China (TUZOV *et al.*, 2000; NEKRUTENKO & TSHIKOLOVETS, 2005; BOZANO & WEIDENHOFFER, 2007).

In the European part of its range, the butterfly is found in widely scattered populations, thriving where suitable habitats remained intact. It suffered a strong decline in the last decades and became extinct in several countries (VAN SWAAY & WARREN, 1999; KUDRNA, 2011).

Its presence in Spain is questionable, since there are no new records after 1985 (GARCIA-BARROS *et al.*, 2004). In many countries a strong decline has been recorded, even in those where populations used to be numerous, like Sweden, Finland and Belgium, where a decrease of 50% has been reported. In Switzerland and Norway the decline is a little less significant, while the strongest population decrease was recorded in Germany and Austria (75-100%), where many populations have become extinct (VAN SWAAY & WARREN, 1999). Also, the nearest populations of the species in Romania are marked as declining. There are several known historical records near Bucharest, Sighisoara and for the Romanian Banat (SZEKELY, 2008). Six known populations are still surviving in Romania, where one near Vad and the one near Baia Mare are being treated as stable. However, even those populations are at risk in the very near future due to afforestation and natural successions or eventual clear forest cuttings (CRAIOVEANU *et al.*, 2013; SZEKELY & CRAIOVEANU, pers. comm.). Also, the butterfly is now treated as extinct on a national level in Slovakia, the Czech Republic, Hungary, Italy and Latvia (VAN SWAAY *et al.*, 2010).

L. helle inhabits peat and sphagnum bogs, damp flowery meadows, woodland margins and clearings, river banks, and hillsides (TSHIKOLOVETS, 2011). The habitat is usually characterised by large densities of the larval host plant *Polygonum bistorta* L. composing *Deschampsia cespitosa*-*Polygonum bistorta* communities on humid, moderately acidic and nutrient poor grasslands (FISCHER *et al.*, 1999). In the Russian part of its range a wider variety of foodplants like *Polygonum amphibium* L., *Rumex aquaticus* L., *Rumex acetosa* L. and *Bistorta elliptica* (Willd. ex Spreng.) are reported (TUZOV *et al.*, 2000), while in Fennoscandia it is reported to use *Polygonum viviparum* L. (TOLMAN & LEWINGTON, 2008). In most of Europe the species is univoltine and can be found on the wing from April to July, most commonly from May to June. It is bivoltine in some German populations (MEYER, 1981) and in Romania (SZEKELY, 2008).

L. helle is listed as endangered (EN) in Europe (VAN SWAAY *et al.*, 2010), and is treated as a Species of Community Interest, included in both Annex II and IV of the Habitats Directive of the European Commission (92/43/EEC).

The paper aims at describing the new findings of this rare and threatened butterfly in the bordering region between Serbia and Bulgaria. Some of the threats affecting its habitats on Stara planina are highlighted and a few conservation actions are proposed for each country.

The surveyed region

The study area comprises the westernmost part of Balkan Mts. (also called Stara Planina Mts.) at the bordering region between Serbia and Bulgaria (see Fig. 1). This large mountain massif spreads from eastern Serbia almost to the Black sea. The very diverse geology, large altitudinal range between foothills and mountain peaks, complex types of soil cover and temperate-continental climate on Stara Planina resulted in high plant and animal diversity (ANĐELKOVIĆ, 1958; LAKUŠIĆ & ČETKOVIĆ, 2007).

New findings of *Lycaena helle* for the Balkans

SERBIA, PIROT, DOJKINCI, PONOR (43° 14' 47" N, 22° 48' 35" E; 1427 m)

The locality Ponor near Dojkinci village refers to montane grassland used as pasture for many years. The geological substrate consists of sandstone rich in mica and quartz and marlstone from the Triassic period (ANĐELOKOVIĆ *et al.*, 1976; CVIJIC, 1996). As the entire area was a lake in distant history (Vladica Stojadinović, pers. comm.), there are some marshy fragments still remaining in the

valley, with the most interesting butterfly habitats on the boggy meadows near the creek, close to the Ponor cave (Fig. 2). It consists of the *Geo coccinei-Deschampsietum caespitosae* plant community with a lot of *Polygonum bistorta* hostplants near the stream and in numerous small sinkholes.

The first three authors visited Ponor on 17-VI-2011 searching for new populations of *Boloria eunomia* (Esper 1799). Although *B. eunomia* was not found in the surveyed area, soon after arrival the first specimens of *L. helle* were spotted. During the whole survey, approximately 30 specimens were seen, almost all of them quite worn, indicating that mid June is the end of their flight season here. The butterflies were often observed resting on *Geum coccineum* Sm. and *Ranunculus* sp. flowers, *Carex* sp. leaves and on vegetation surrounding the creek. Two females and two males were collected for detailed study, and more butterflies were photographed. The locality was revisited on 9-VII-2011, but as expected, no butterflies were spotted. During the next year, the area was revisited by the authors but only few butterflies were recorded probably due to bad weather: Popović & Đurić, 29-V-2012, four females (Fig. 4), one male, all fresh; Tamás Hapka, 2-VI-2012, eight specimens; Franeta, 16-VI-2012, two specimens, a fresh female and a very worn male.

During our surveys the following butterfly species were recorded on Ponor: *Carterocephalus palaemon* (Pallas, 1771), *Erynnis tages* (Linnaeus, 1758), *Ochlodes sylvanus* (Esper, 1777), *Pyrgus malvae* (Linnaeus, 1758), *Callophrys rubi* (Linnaeus, 1758), *Celastrina argiolus* (Linnaeus, 1758), *Cupido minimus* (Fuessly, 1775), *Cyaniris semiargus* (Rottemburg, 1775), *Aricia eumedon* (Esper, 1780), *Lycaena candens* (Herrich-Schaffer, 1844), *Lycaena tityrus* (Poda, 1761), *Phengaris alcon* ([Denis & Schiffermüller], 1775), *Plebejus argus* (Linnaeus, 1758), *Polyommatus amandus* (Schneider, 1792), *Polyommatus eros* (Ochsenheimer, 1808), *Polyommatus icarus* (Rottemburg, 1775), *Aglais io* (Linnaeus, 1758), *Aglais urticae* (Linnaeus, 1758), *Argynnis pandora* ([Denis & Schiffermüller], 1775), *Argynnis paphia* (Linnaeus, 1758), *Boloria euphrosyne* (Linnaeus, 1758), *Coenonympha glycerion* (Borkhausen, 1788), *Coenonympha rhodopensis* Elwes, 1900, *Erebia albertanus* (de Prunner 1798), *Erebia medusa* ([Denis & Schiffermüller], 1775), *Erebia oeme* (Hubner, 1804), *Issoria lathonia* (Linnaeus, 1758), *Lasiommata maera* (Linnaeus, 1758), *Melitaea athalia* (Rottemburg, 1775), *Melitaea cinxia* (Linnaeus, 1758), *Melitaea diamina* (Lang, 1789), *Melitaea didyma* (Esper 1778), *Vanessa cardui* (Linnaeus 1758), *Parnassius mnemosyne* (Linnaeus, 1758), *Colias croceus* (Fourcroy, 1785), *Leptidea sinapis* (Linnaeus, 1758), *Pieris rapae* (Linnaeus, 1758) and *Hamearis lucina* (Linnaeus, 1758).

SERBIA, PIROT, DOJKINCI, KOPREN (43° 17' 17" N, 22° 48' 29" E; 1776 m)

The grassy vegetation of Ponor spreads uphill towards the Kopren plateau in the north-east, and further into Bulgaria. Geological strata of the wider area mainly consist of silicate sandstones (ANĐELKOVIĆ *et al.*, 1976) making the area water-rich, and providing suitable habitats for the *L. helle*. These grasslands were used for grazing for many years, but nowadays less so due to abandonment, which lead towards a succession in favour of *Juniperus nana* Willd. communities (*Vaccinio-Junipereto-Piceetum subalpinum*). Here, a similar *Geo coccinei-Deschampsietum caespitosae* plant communities could be found close to the numerous small streams.

L. helle was recorded in this region by chance, when the first author noticed a small photograph of the butterfly (Fig. 5) on the back cover of the book "Basic Ecology" (PEŠIĆ, 2011). The picture was taken by Tijana Jovanović on the Kopren plateau on 23-V-2010.

Due to a lack of research, only three more species were recorded in the region: *Lycaena candens*, *Aglais io* and *Erebia orientalis* Elwes 1900.

BULGARIA, STARA PLANINA ABOVE THE CHIPROVCI WATERFALL (43° 22' 12" N, 22° 46' 38" E; 1750 m)

The orography and vegetation cover in the Bulgarian part of Stara Planina are somewhat different from the Serbian part, as there are no large open grass areas, instead only steep mountain slopes with *Juniperus nana* (*Vaccinio-Junipereto-Piceetum subalpinum*). Suitable habitats for *L. helle* are found

only near streams along the mountain slopes. The vegetation surrounding the stream is similar to the one found on Ponor and Kopren, with a lot of *Polygonum bistorta* and *Geum coccineum* plants (Fig. 3). This *Geo coccinei-Deschampsietum caespitosae* plant communities are limited to the area between the springs of small streams and the tree-line.

The first recorded observation of *L. helle* in Bulgaria was made during a bird survey by the last two authors for the BSPB (Bulgarian Society for the Protection of Birds) on 11-VI-2012. During this survey six specimens were found, but the authors remained unaware of earlier records of *L. helle* from Serbia. After recording their observation on Observado.org the authors realised the rare status of the species, so they contacted several Dutch entomologists and revisited the locality on 16-VI-2012 searching for more specimens in a wider area. During this survey another twenty five specimens were found, about three kilometres south-east of the original spot (4320'42" N, 2248'14" E). The specimens were spotted near a stream very similar to the one mentioned in the first observation. Eggs and caterpillars of *L. helle* were also found, on the leaves of *Polygonum bistorta*. Most of the specimens where found at altitudes between 1650 and 1850 meters.

Threat and conservation of *Lycaena helle* habitats in Serbia

With a total of 160 butterfly species recorded (Popović & Đurić, unpublished data), Stara Planina is the richest area in Serbia. It is listed as Prime Butterfly Area (JAKŠIĆ, 2008), Important Bird Area (PUZOVIĆ *et al.*, 2009) and Important Plant Area. Also, according to the Convention on the conservation of European wildlife and natural habitats (Council of Europe T-PVS/PA (2012) 18) this area is proclaimed a candidate Emerald site. The Serbian part of the mountain was nationally protected as Nature Park in 1997, but the regulations of its protection were changed in 2009 (Official Gazette of RS, No. 19/97 and 23/09), along with changes in the Law on Nature Protection (Official Gazette of RS, No. 36/09, 88/10 and 91/10), legalizing many construction activities in the protected areas, including those related to skiing facilities. As a consequence, the nature of the area has been severely damaged, especially due to the construction of new hotels and ski tracks. The highly affected populations of *Boloria eunomia* in Serbia are strongly declining, with some local populations already extinct.

The biggest threat to the entire area is the Spatial plan for Nature Park and tourist region Stara Planina adopted by the Serbian government (Official Gazette of RS, No. 115/08). The main ski tracks for Nordic skiing are planned to be cut through *Lycaena helle* habitats, which could have dramatic consequences on those important high mountain habitats. Finally, in 2013, the Serbian Ministry of Finance and Economy has proposed that tourism development in the area became a project of national importance (Document No. 332-01-00077/2013-35), de facto legalizing construction activities in the most threatened parts of the mountain. Water drainage will also be a serious threat in the future, as water from small springs and bogs has been taken for touristic requirements. Abandonment of traditional pasture is considered to be one of the most serious threats to *L. helle* populations in the European Red List of Butterflies (VAN SWAAY *et al.*, 2010). This is typical for the entire area of Stara Planina, where high mountain grasslands are being overgrown by *Juniperus nana*. Although the process may be slower on the higher altitudes of Kopren plateau, the absence of grazing is already noticeable here. In contrast, low level of grazing on Ponor seems to sustain this habitat well over the years. The habitats near Ponor are threatened by intentional burning of large parts of the grassland, as the fires can easily get out of control. Also, Ponor and the Ponor cave are becoming more a more popular tourist attraction, and in mid July some parts of the grassland area in the butterfly habitat are being trampled by mountain hikers.

Since *L. helle* was only recently discovered in Serbia, it was not listed as a protected species. Also, the species is not included in the list of species important for designation of Emerald areas and it would be important to declare it strictly protected in Serbia, as this is the only applicable legal mechanism at the moment.

The first step toward the protection is mapping of habitats and butterfly populations and

establishing appropriate monitoring. The conservation activities in this region should include popularization and marking of threatened butterfly habitats which are easily approachable for tourists. Certain efforts should be made to control burning of grasslands and to promote low level grazing on these high mountain pastures, thus slowing down the succession toward the forest ecosystems (see FISCHER *et al.*, 1999; GOFFART *et al.*, 2010). Already proposed plans range from returning local breed of cows called Buša or horses to the high mountain pastures, to the plans of reintroduction of European bison. Mowing of the meadows on Ponor and cutting the *Juniperus nana* trees in the Kopren region could also be plausible. Finally, it is of prime importance to reduce corruption in the state institutions, to stop illegal construction, wood-cutting and water capturing. Some improvement has already been made through actions of NGO organisations and through joint actions with the managers of the Nature Park, but it is still insufficient to make a significant impact on illegal activities. However, for the time being there are still no construction activities in the region where *L. helle* flies, and if Serbia accesses the European Union, these habitats will be under stricter protection.

Threats and conservation of *Lycaena helle* habitats in Bulgaria

The Bulgarian side of western Stara Planina was also listed as one of the Prime Butterfly Areas, Important Bird Areas, Important Plant Areas and CORINE areas (ABADIJEV & BESHKOV, 2007). On the national level there is no unique protected nature park covering the whole territory, but a few nature reserves. However, the most important conservation tool for the region could be found in international mechanisms since Western Stara Planina is a part of the Bulgarian Natura 2000 network (State Gazette of Bulgaria, No. 85/2007 and 96/2010).

ABADIJEV & BESHKOV (2007) have recognized many negative impacts in the area including ground water capturing, irregular management, unsustainable tourism, construction of stone quarries and plans for wind-power parks.

Due to its recent discovery, *L. helle* was not included in Bulgarian national legislation, but it is listed under the Annexes of the Habitats Directive. Although the species was not considered during the designation of Natura 2000 areas, it could easily be protected by applying the management plans under the already existing Natura 2000 site: Western Stara Planina.

Land abandonment is also present here, but it doesn't seem to affect butterfly populations, as a lot of suitable habitats remain near creeks due to very different hydrological conditions. Also, the Bulgarian sites are more remote, so existing small scale tourism does not represent a real threat for butterflies at present. The same could be applied for the other threats mentioned. Still, it is important to map the potential habitats and butterfly populations and to ensure proper monitoring of these habitats. Although *Juniperus nana* is not a great threat for butterfly populations at the moment, in the long term *Picea abies* forests could take over *J. nana*, making most of the habitats unsuitable for the butterflies.

Regional Red List status of *Lycaena helle*

Due to very limited distribution within both countries, potential decline due to habitat loss and the fact that the species is a strict habitat specialist it should be considered as endangered (EN). The area is hosting an isolated population of *Lycaena helle*, with the closest records in Romania being more than 400 km, thus the rescue effect is unlikely to occur. Total extent of occurrence (EOO) is 40 km², a total area occurrence (AOO) is 16 km² in less than five locations and with deteriorating conditions in the region. Thus we assess the population as endangered (EN) according to IUCN criteria B 1ab(ii, iii, iv) + 2ab(ii, iii, iv) (IUCN, 2001).

Conclusion

New records of *L. helle* shift the known area of the species in Europe further to the south, which make them very important. The species is inhabiting bog habitats near mountain streams overgrown in

tall-forb vegetation of *Geo coccinei-Deschampsietum caespitosae* plant communities typical for the wider region of south-eastern Europe. It is now important to map these habitats of the endangered butterfly on Stara Planina, and to plan appropriate management in order to slow down habitat succession toward forest communities. This could easily be achievable in Bulgaria, since the area is a part of Natura 2000 network. In Serbia, this goal is more challenging due to the expansion of ski tourism and the fact that the country is not a part of the European Union and Natura 2000 network.

Acknowledgements

The authors are thankful to Rudi Verovnik and Vladimir Randelović for useful suggestions on this article, and to our friends Aca Đurđević, Ivan Simonović and Tamás Hapka for accompanying us during some surveys. We would also like to give special thanks to Tijana Jovanović and Tamás Hapka for letting us use their photographs. We would like to thank Chris van Swaay and Pieter Vantieghem for making the last two authors aware of the rarity of the species in Bulgaria and Svetlana Miteva for bringing them into contact with the other authors. Discovery of the species came from the survey organized as a part of the project "Endangered Serbian Butterflies - urgent need for Research and Conservation", financed by The Rufford Small Grants Foundation, project no. 9495-1.

BIBLIOGRAPHY

- ABADJIEV, S. & BESHKOV, S., 2007.– *Prime Butterfly Areas in Bulgaria*: 222 pp. Pensoft Publishers, Sofia.
- ANĐELKOVIĆ, M. Ž., 1958.– *Geološki sastav i tektonika jugozapadnih padina Stare Planine*: 48 pp. Izdavačka ustanova srpske akademije nauka, Beograd.
- ANĐELKOVIĆ, J., KRSTIĆ, B., MARTINOVIĆ, D. & BOGDANOVIĆ, P., 1976.– *Osnovne geološke karte Srbije 1:100000 K34-34 Piro*. Vojnogeografski Institut, Beograd.
- BOZANO, G. C. & WEIDENHOFFER, Z., 2002.– *Guide to the butterflies of the Palaearctic region. Lycaenidae, part 1*: 62 pp. Omes Art,
- CRAIOVEANU, C., SITAR, C. & RÁKOSY, L., 2013.– Mobility, behaviour and phenology of the Violet Copper *Lycaena helle* in North-Western Romania - implications for conservation.– In J. C. HABEL, M. MEYER & T. SCHMITT (eds.). *Jewels in the mist - A biological synopsis on the endangered butterfly Lycaena helle*: 150 pp. Pensoft, Praha. [in press]
- CVJIĆ, J., 1996.– *Morgologija i hidrologija istočne Srbije (sabrana dela jovana cvijića, knjiga 13); urednici Petrović, D & Ranković, D*: 220 pp. Srpska akademija nauka i umetnosti, Zavod za udžbenike i nastavna sredstva, Beograd.
- FISCHER, K., BEINLICH, B., & PLACHTER, H., 1999.– Population structure, mobility and habitat preferences of the violet copper *Lycaena helle* (Lepidoptera: Lycaenidae) in Western Germany: implications for conservation.– *Journal of Insect Conservation*, **3**: 43-52.
- GARCÍA-BARROS, E.; MUNGUIRA, M. L.; MARTÍN CANO, J.; ROMO BENITO, H.; GARCIA-PEREIRA, P. & MARAVALHAS, E., 2004.– Atlas de las mariposas diurnas de la Península Ibérica e Islas Baleares.– *Monografía de la S. E. A.*, **11**: 1-228.
- GOFFART, P., SHTICKZELLE, N., & TURLURE, C., 2010.– Conservation and Management of the Habitats of Two Relict Butterflies in the Belgian Ardenne: *Proclossiana eunomia* and *Lycaena helle*. In HABEL, J.C., & ASSMANN, T., (eds.). *Relict Species: Phylogeography and Conservation Biology*: 357-370. Springer Berlin Heidelberg.
- IUCN, 2001.– *IUCN Red List Categories and Criteria: Version 3.1*: 30 pp. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, U.K.
- JAKŠIĆ, P., (ed.) 2008.– *Prime Butterfly Areas in Serbia*: 223 pp. HabiProt, Belgrade.
- KUDRNA, O., HARPKE, A., LUX, K., PENNERSTORFER, J., SCHWEIGER, O., SETTELE, J., & WIEMERS, M., 2011 - *Distributions Atlas of Butterflies in Europe*: 576 pp. Gesellschaft für Schmetterlingsschutz eV, Germany.
- LAKUŠIĆ, D. & ČETKOVIĆ, A., (eds.) 2007.– *Biodiverzitet Stare planine u Srbiji - Rezultati projekta: "Prekogranična saradnja kroz upravljanje zajedničkim prirodnim resursima - Promocija umrežavanja i*

- saradnje između zemalja Jugoistočne Evrope*": 253 pp. Regionalni centar za životnu sredinu za Centralnu i Istočnu Evropu, Kancelarija u Srbiji. Beograd.
- MEYER, M., 1981.– Révision systématique, chorologique et écologique des populations européennes de *Lycaena (Helleia) helle* [Denis; Schiffermüller, 1775]; (Lepidoptera: Lycaenidae).– *Linneana Belgica*, **8**(6): 238-260.
- NEKRUTENKO, Y. & TSHIKOLOVETS, V., 2005.– *The Butterflies of Ukraine*: 231 pp. Rayevsky Scientific Publishers, Kyiv.
- PEŠIĆ, S., 2011.– *Osnovi ekologije*: 303 pp. Prirodno-matematički fakultet, Univerzitet u Kragujevcu, Kragujevac.
- PUZOVIĆ, S., SEKULIĆ, G., STOJNIC, N., GRUBAČ, B., & TUCAKOV, M., 2009 - *Important Bird Areas in Serbia*: 279 pp. Ministry of Environment and Spatial Planning, Institute for Nature Conservation of Serbia, Provincial Secretariat of Environmental Protection and Sustainable development.
- TOLMAN, T. & LEWINGTON, R., 2008.– *Collins Butterfly Guide: The Most Complete Guide to the Butterflies of Britain and Europe*: 528 pp. Harper Collins Publishers, London.
- SZEKELY, L., 2008.– *The butterflies of Romania - Fluturii de zi din Romania*: 305 pp. Brasov County History Museum, Brasov.
- TSHIKOLOVETS, V., 2011.– *Butterflies of Europe & the Mediterranean area*: 544 pp. Tshikolovets Publications, Pardubice.
- TUZOV, V. K.; BOGDANOV, P. V.; CHURKIN, S. V.; DANTCHENKO, A. V.; DEVYATKIN, A. L.; MURZIN, D. J., SAMODUROV, G. D. & ZHDANKO, A. B., 2000.– *Guide to the Butterflies of Russia and Adjacent territories (Lepidoptera, Rhopalocera): Libytheidae, Danaidae, Nymphalidae, Rionidae, Lycaenidae*, **2**: 580 pp. Pensoft, Moscow.
- VAN SWAAY, C. A. M. & WARREN, M. S., 1999.– Red Data book of European butterflies (Rhopalocera).– *Nature and Environment*, **99**. Council of Europe Publishing, Strasbourg.
- VAN SWAAY, C. A. M., CUTTELO, D. A., COLLINS, S., MAES, D., LÓPEZ-MUNGUIRA, M., ŠAŠIĆ, M., SETTELE, J., VEROVNIK, R., VERSTRAEL, T., WARREN, M., WIEMERS, M. & WYNHOFF, I., 2010.– *European Red List of Butterflies*: 47 pp. IUCN & Butterfly Conservation Europe, EU.

*M. P.
HabiProt
Bulevar Oslobođenja, 106/34
RS-11040 Beograd
SERBIA / *SERBIA*
E-mail: milos@habiprot.org.rs

M. Đ.
HabiProt
Bulevar Oslobođenja, 106/34
RS-11040 Beograd
SERBIA / *SERBIA*
E-mail: milan@habiprot.org.rs

F. F.
HabiProt
Bulevar Oslobođenja, 106/34
RS-11040 Beograd
SERBIA / *SERBIA*
E-mail: fmfraneta@t-com.me

J. D.
Leoninusstraat, 62
NL-6821 ET Arnhem
HOLANDA / *THE NETHERLANDS*
E-mail: jvandeijk@gmail.com

R. V.
Paapstraat, 3
NL-7202 AT Zutphen
HOLANDA / *THE NETHERLANDS*
E-mail: rubenvermeer90@gmail.com

*Autor para la correspondencia / *Corresponding author*

(Recibido para publicación / *Received for publication* 26-II-2013)
(Revisado y aceptado / *Revised and accepted* 30-V-2013)
(Publicado / *Published* 30-VI-2014)

